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POROUS LAMINATED PROTECTIVE HEAD SHIELD

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Recommend Approval:

Fred Leonard
Scientific Director

Approved:

John R. ...
Director

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A B S T R A C T

A porous laminated protective head shield has been designed and fabricated. It provides protection, is light in weight and comfortable. Initial subjective evaluation is favorable.

POROUS LAMINATED PROTECTIVE HEAD SHIELD

I. INTRODUCTION

A 4-year old female patient, suffering from akinetic epilepsy and subject to falls which often result in bruises and cuts of the head, was presented to the Prescription Clinic Committee, APRL, for a protective head shield. The patient had been previously fitted with a football helmet which she found excessively heavy and warm.

The problem was to design a head shield which would offer head protection, be light in weight, and cool. It appeared to the committee that a shield constructed from a porous laminate, lined with foam rubber in strategic areas, would have the desired characteristics.

It is the purpose of this report to describe the design and fabrication of such a shield.

II. DESIGN AND FABRICATION

It was not possible to obtain a plaster-of-Paris wrap of the head of the patient, but sufficient width and circumferential measurements could be taken of the head to prepare a plaster mold. The plaster-of-Paris mold was coated with Hi-Glo (1) parting agent and two layers of nylon stockinet were pulled down over the mold and saturated with paraffin wax to obtain a wax check model. After cooling, the wax-nylon check mold was removed from the plaster-of-Paris mold and held in warm water long enough to make it pliable so that it could be molded to fit the patient's head. After fit was obtained, the mold was trimmed to fit the forehead, around the ears, and to the hair-line at the back of the head.

Now a positive mold was prepared by pouring a mixture of plaster-of-Paris and water into the nylon-wax check mold. After the plaster had set, the check mold was removed and the positive mold smoothed down with wire gauze. Two layers of stockinet were pulled down over the mold and tied off to increase the size of the head shield for a comfortable fit. Then, one layer of 3/8" foam was form-fitted over

(1) L-785 Hi-Glo Plastic Parting Lacquer, manufactured by the Lacquer Corporation, Dallas 12, Texas

the stockinet without stretching, as this thickness was used for padding in the final head shield. A polyvinyl alcohol (PVA) sheet was pulled down over the entire mold for separating the plastic resin from the foam rubber.

Five layers of nylon stockinet were pulled down over this layup and tied off. One layer of nylon Ban-Lon 100/2--200--needle stockinet was applied on the outer surface for a smooth appearance.

The resin used was 125 gms. of Laminac 4110 (1) and 2.25 gms. of Luperco ATC (2), mixed thoroughly, and color paste added to give a pleasing flesh tone. Trichloroethylene 54 (3) and Naugatuck's Promoter #3 (4) (6 drops per 100 gms. of resin) were added. The entire surface was brush-coated with this mixture and excess resin removed from the laminate by stringing down. This laminate was allowed to air-cure for approximately 30-45 minutes. A moist PVA sheet was stretched over the layup, the resin allowed to harden at room temperature, and then placed in a 100°C oven for an additional 45-60 minutes. The cured laminate was cut off the mold, trimmed, and the foam rubber removed. The first two layers of stockinet were left in place.

A strip of foam rubber, 1-1/4" wide and 3/8" thick, was fastened to the inner surface of the front part of the helmet to form a sweat band and this was covered with horsehide to prevent chipping and peeling of the foam. Other foam strips were placed 1" apart around the circumference of the shield. A chin strap was riveted into place just in front of the ears, and a foam piece covered with horsehide for use as a chin rest, with buckle for adjustment, was incorporated in the chin strap.

Photographs of the fabricated head shield and of the patient wearing it are shown in figures 1 and 2.

III. COMMENT

The patient has been wearing the helmet for two months without incident. Comments by the patient and her mother are favorable.

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- (1) Laminac 4110 , Rohm & Haas, Philadelphia 5, Pa.
 - (2) Luperco ATC, Lucidol Division, Wallace & Tiernan, Inc., Buffalo 5, New York
 - (3) Trichloroethylene, Fisher Scientific Co., Silver Spring, MD.
 - (4) Promoter #3, Naugatuck Chemical Division, U.S. Rubber Co., Naugatuck, Connecticut.

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